VISITOR SUPPORT PROGRAM:
Data and Technology Exchange on Sediment Acoustics and Seafloor Mapping

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LONG-TERM GOALS

The long term goals of our visit to ONR and NRL are: (1) to develop a cooperative research program on sediment acoustics (acoustic seabed classification using sonar data) and seafloor mapping using multi-beam sonar between Korean and NRL/U.S. scientists and (2) to help facilitate NRL's use of research vessels of Korean universities and/or research institutions for NRL's future cruises in the Korean waters.

OBJECTIVES

The objective of our visit to ONR was to discuss the future cooperation in research operations between U.S. scientists who are involved in the projects funded by ONR and Korean scientists who have done sediment acoustics and sea-beam mapping. The possible research operations include real-time seafloor sediment type classification using acoustic sonar data and detailed bathymetric mapping in the Ulleung Basin, East Sea (Sea of Japan) using multi-beam sonar systems operated by the research institutes of Korea (e.g., Korea Ocean Research and Development Institute (KORDI) and National Ocean Research Institute of Korea (NORI)).

The objective of our visit to NRL in Washington, DC, was to discuss:

(1) The potential for exchange of seafloor and subsurface sediment data in Korean waters. Profs. Kim, Park, and Lee have been compiling seafloor and shallow subsurface sediment data for the Korean waters since 1997. These data can be used by NRL scientists who are working in the East Sea of Korea. NRL also has accumulated important sediment data in the Ulleung Basin; some of these data can hopefully be shared by Korean scientists.

(2) The possibility of technology transfer/data exchange regarding multi-beam data processing and interpretation for detailed seafloor mapping. Research institutes of Korea (KORDI, NORI) are currently active in acquiring multi-beam data but lack experienced personnel who can process and interpret the data. We hope that Korean scientists can visit NRL and participate in multi-beam data analysis. Data acquired in the Ulleung Basin by the Korean research institutes can be shared by the NRL scientists to compliment the existing data.

(3) The possibility of NRL's use of Korean research vessels for NRL's planned and future cruises in the Korean waters.

The objective of our visit to NRL (Stennis Space Center) was to discuss the potential for technology exchange regarding real-time seabed classification. Profs. Kim, Park, Lee and other Korean scientists are currently developing an algorithm to classify seafloor sediment using single-frequency (50 kHz) sonar. This algorithm will hopefully replace the algorithm most commonly used in acoustic seabed classification that was developed by Quester Tangen Corporation. We would like to learn about the inversion algorithm that is being employed by NRL scientists to extract sediment physical properties from acoustic data.

APPROACH

The approach was to have: (1) intensive discussion sessions including presentations by ONR (Wilkens) and NRL (Gardner, Richardson) scientists and visiting scientists and informal discourses on topics related to visiting scientists' research. ONR and NRL scientists first gave presentations on their current research, followed by an overview on related research activity by visiting scientists. After the presentations, the potential for data/technology exchange and future cooperation in research operations were discussed.

TRAVEL COMPLETED

Table 1. Summary of visits conducted under this VSP.

Person Visited	Position	Institution / Conference	Location	Scientific / Technical Purpose	Dates (mm/dd/yy)
Roy Wilkens	Head, Marine Geology and Geophysics	Office of Naval Research	800 N. Quincy St., Arlington, Virginia	Discussion on future cooperation	08/14/01
Joan Gardner	Marine Geologist	Naval Research Laboratory	4555 Overlook Avenue, SW Washington, DC	Discussion on future cooperation, data exchange, and use of Korean vessels	08/15/01
Woo-Yeol Jung	Senior Scientist	Naval Research Laboratory	4555 Overlook Avenue, SW Washington, DC	Discussion on future cooperation, data exchange, and use of Korean vessels	08/15/01
Michael Richardson	Head, Seafloor Sciences Branch, Code 7430	Naval Research Laboratory	Stennis Space Center, Mississippi	Discussion on their current research and data/technology exchange	08/16/01
Warren Wood	Scientist	Naval Research Laboratory	Stennis Space Center, Mississippi	Discussion on gas hydrate project	08/16/01
Peter Fleischer	Oceanographer	Naval Oceanographic Office	Stennis Space Center, Mississippi	Discussion on data exchange	08/16/01

RESULTS

At ONR Head Office, Dr. Roy Wilkens gave an overview of the ONR structure and presented the details of the projects that ONR is currently funding. Following discussion included future collaborative work between U.S. scientists and Korean scientists including us. Dr. Wilkens also discussed various funding opportunities (e.g., NICOP) and short-term visiting programs for foreign scientists.

At NRL in Washington, DC, we visited Ms. Joan Gardner and Dr. Woo-Yeol Jung. First, Ms. Gardner gave a presentation on their researches in the East Sea. Prof. Kim gave a presentation on our researches on sediment acoustics and physical properties in the nearshore regions of Korea. Prof. Kim also gave an overview of the Underwater Acoustic Research Center (UARC) that is the only national center for underwater acoustics study in Korea. After the presentations, we had an informal discussion session. Ms. Gardner was interested in using equipments in Korean institutions for their cruise in the East Sea scheduled in November, 2001. She also asked us to get help from Korean scientists and/or graduate students during the cruise. Korean scientists need to get hands-on experience in multi-beam data acquisition and processing. We will have further discussion on these matters.

At NRL in Stennis Space Center, Dr. Richardson showed their current researches (e.g., mine burial prediction) and introduced a number of scientists who have been involved in sediment acoustics and gas hydrate research. Dr. Richardson is a leader in sediment acoustic studies in the Navy lab and has extensive work on problems of propagation of acoustic waves in gassy sediments. Our experience in sediment acoustics in the shallow waters of Korea will compliment the NRL research for future collaboration. We visited NRL's sediment acoustics lab and had long discussion with the NRL's acousticians on the algorithm that NRL is using for real-time seabed classification. We also briefly introduced the algorithm that we have been developing.

Dr. Warren Wood showed the results of their research on P-wave attenuation in the methane hydrate and deep-tow seismic investigations of methane hydrates. We also visited sediment acoustics lab and sediment physical property lab. Seabed classification using sonar signal that is currently investigated by some of the scientists at NRL was especially interesting because it is what we have been doing since 1999.

Dr. Peter Fleischer from Naval Oceanographic Office who is in charge of the database for sediments in the Korean waters was interested in the database we have constructed. Data exchange was the major topic of discussion

IMPACT/APPLICATIONS

Visits to ONR and NRL have allowed us to gain an insight into current status of the ONR projects and researches on sediment acoustics, seafloor mapping, and mine burial processes. We have learned that NRL not only wants to get access to our database but also is seeking cooperation from Korean scientists in their planned cruises in the East Sea. The knowledge we have gained during our visits has an immediate impact on our current research such as 'real-time seabed classification using sonar data', 'acoustic/physical properties of shallow sediments of the Korean seas' and 'acoustic modeling' and will help other Korean scientists have better understanding of the ONR and NRL projects. We will be key contacts in Korea for NRL scientists who are planning cruises in the Korean waters. Our visits will

hopefully lead to collaborative work in the very near future. The possibility of data exchange is another important outcome of our visits.

TRANSITIONS

Not Applicable.

RELATED PROJECTS

We have been actively involved in sediment acoustic modeling and seabed classification using sonar signal. We have also been constructing database for texture and physical/acoustical properties of surface and near-surface sediments of the Korean seas. One of our projects is under the auspices of the Underwater Acoustic Research Center in Seoul National University (http://uarc.snu.ac.kr).